

Australia by the north while the continent was being upheaved and its climate still humid, and to have become differentiated since the entire drying up of the interior sea so desiccated the country as once more to isolate West Australia almost as effectually as if it were surrounded by water. But Mr. Wallace does not make this sufficiently clear. When, however, we come to that part of Mr. Wallace's hypothesis which deals with the connexion between Australia and New Zealand we find it to be not so satisfactory. In the first place, the facts of geology are against any connexion having taken place between the two countries at the time supposed. In the second place, the South-American element in the fauna and flora is not separated from the Antarctic element. In the third place, the hypothesis fails to explain the South-American element, except on the supposition of large extensions of land during the warm Miocene period, for which there is no sufficient evidence, and which if it had occurred would have allowed birds as well as frogs and land-shells to pass. And in the fourth place, it ignores altogether the special relation which exists between New Zealand and some of the islands in the Pacific. The hypothesis here proposed is no doubt incomplete, and will be much improved when the palæontology of New Zealand is better known; but it does, I think, give a fairly satisfactory account of the origin of the South-American, Australian, and Polynesian elements in our fauna and flora. The Antarctic and North-Temperate elements still remain for consideration; but so wide a subject cannot be entered upon at the end of an address, and I must postpone all discussions to some future occasion.

XLIX.—*Description of a new Genus of Fossil Fishes from the Lias.* By JAMES W. DAVIS, F.G.S. &c.

[Plate XVI.]

Genus LISSOLEPIS, Davis.

Class PISCES. Subclass PALÆICHTHYES. Order GANOIDEI.  
Suborder ACIPENSEROIDEI. Family PALÆONISCIDÆ.

Body fusiform; head large; gape wide; jaws elongated, furnished with closely-set uniform enamel-tipped teeth; scales of medium size, rhomboidal, mostly with smooth surface, a few anterior ones with slight furrows, posterior margin serrated;

pectoral fins large and broad; ventral fin smaller; anal fin largest; caudal fin equilobate heterocercal. Notochord persistent.

*Lissolepis serratus*, Davis.

The specimen of fossil fish which forms the subject of the observations following, presents several peculiar features which render it worthy of careful study. For the most part it is beautifully preserved, the only part wanting being the posterior portion of the dorsal margin of the body along with the dorsal fin. The bones of the head to a large extent, the scales, the pectoral, ventral, anal, and caudal fins remain undisturbed. The entire length between the snout and the extremity of the caudal fin is 8.2 inches; of this length the head occupies 2.6 inches, or about one third the entire length. The greatest depth is between the ventral fin and the dorsal surface, where it is 2.2 inches. The cranial bones are strong, covered with enamel, the surface of which is ornamented with numerous pustulations, somewhat irregular in form. The superior portion of the orbit is well defined and prominent. The orbit is comparatively small, placed about equidistant between the upper jaw and the roof of the cranium, and .7 inch behind the snout. The jaws are large, capable of wide expansion, and armed with closely-set, sharp, conical teeth, curved slightly inwards, their points capped with enamel. The mandible is 1.6 inch in length; it is slightly expanded in front near the symphysis; its median portion is somewhat attenuated, whilst posteriorly the bone becomes deeper and stronger. The maxilla is large; its posterior portion has been slightly displaced and damaged, and is consequently obscure; but it appears to have had a tolerably wide expansion towards the orbit. The premaxillary bone is .3 inch in length, and has attached to it a number of teeth similar to those on the maxilla and mandible. The operculum is more or less rounded, except on the anterior margin, which presents a concave outline; attached to its lower surface there is an interopercular bone; it is about one half the size of the operculum, and probably extends to form a connexion with the branchiostegal rays, of which there are some indications below the mandible. A series of clavicular bones extend posteriorly behind the opercula. The lower portion of the external covering of the head is removed, and the scapula, contiguous to the pectoral fin, is exhibited. The operculum is enamelled and covered with punctures; the interoperculum presents similar characters. The frontal and ethmoid bones do not project beyond the premaxillaries; they are strongly

coated with ganoine, their surface ornamented with vermiculate ridges.

The surface of the body is covered with thickly-enamelled rhomboidal scales; the scales along the lateral line are larger than those above or below, and largest near the head, where the height of each scale is double the breadth; nearer the tail the scales are more nearly equilateral. They are arranged in rows, with a slightly sigmoidal curvature backwards from the dorsal towards the ventral surface of the fish. The number of scales in each row varies from twenty-eight in the deepest part of the fish to fourteen near the caudal extremity. Along the flank, on each side of the lateral line, the scales are also arranged in rows antero-posteriorly; but this does not hold good for more than four or five rows, the arrangement towards both the dorsal and the ventral aspect being more or less indeterminate. Dorsally the scales are smaller, but in front of the dorsal fin they are higher than broad; on the ventral portion they are broader than the median ones, the height being only about one third the breadth. The posterior margin of each scale is finely serrated, as represented in Pl. XVI. fig. 1 *a*. The surface in the large majority is smooth; a few scales nearest the head are slightly striated with minute furrows. The posterior margin of the scales becomes gradually less serrated towards the caudal extremity, and those behind the anal fin are devoid of serrations and quite smooth. The body-scales extend 1 inch beyond the fork of the tail over its upper lobe; they are irregular in form; those in contact with the fin-rays are much elongated.

The *dorsal fin* is absent, and there is nothing to indicate its exact position. The *pectoral fins* are both preserved in this specimen; they are large, a little more than 1·2 inch in length. There are twenty rays in each, which for a distance of ·5 inch remain simple and unarticulated; beyond that distance the rays bifurcate, and in several instances, if not in all, the bifurcations dichotomize towards the outer margin of the fin. The bifurcated rays are composed of numerous joints, divided by transverse articulations. The anterior rays of the fin are the longest and the strongest; there is no appearance of fuleral rays. The *ventral fins* are situated 1·7 inch behind the pectoral fins. In this specimen the fin is folded and extends along the side of the fish; it is ·9 inch in length. The anterior rays are very strong, and at the base a number of large black enamelled fulcra are situated. The *anal fin* is situated 1·5 inch in front of the tail; it is larger than the pectoral or ventral fins, being 1·3 inch in length. The anterior rays are the longest

in this fin as in the others, and along the front of the anterior ray there is a number of strong fulcral scales. The basal portion of each ray is grooved and smooth for about a quarter of an inch, beyond which the rays are articulated at short intervals and dichotomize freely. The *caudal fin* is large, bifurcated, heterocercal, and equally lobed. The vertebral column extends at least an inch beyond the termination of the body into the upper lobe of the tail, and the surface is covered with enamelled scales to an equal distance; from the posterior margin spring sixteen rays, which are articulated and freely dichotomize. The ventral surface of the body from the anal fin to the root of the tail is protected by a series of large enamelled plates, which assume a fulcral aspect near the commencement of the lower lobe. The rays of the lower portion of the fin are stronger than those above, and are 1·6 inch in length. They are articulated at short intervals, and each ray dichotomizes; the external ones begin to divide at about 1 inch from the base, and only divide once, whilst those shorter and nearer the centre of the lobe divide into four, and, in a few cases, into six fine-jointed rays. The margin of the lobe is bordered by a row of small obliquely arranged slender fulcra.

This ichthyolite, as already described, possesses many strongly marked characters, the most prominent being the extremely long jaws and wide gape, the sculptured surface-enamelled plates for the protection of the head, the anteriorly situated orbit, and the well-developed clavicles. The rhombic scales beautifully imbricating, with serrated posterior margins and smooth surface; wide along the lateral line, very narrow ventrally. Pectoral and ventral fins paired, the former very large, composed of frequently-dichotomizing closely-set rays. Single and large anal fin. Heterocercal tail with vertebral prolongation into the upper lobe; the lower lobe, as well as the anal and ventral fins, having a series of fulcral scales along the anterior margin. These characters indicate its relationship to the family Palæoniscidæ, as defined by Dr. Traquair\*. Of the twenty-two genera included in this family by that author four have been obtained from the Lias, the remainder occurring in the older strata of the Permian and Carboniferous rocks. The four genera from the Lias are *Centrolepis*, Egerton; *Oxygnathus*, Egerton; *Cosmolepis*, Agassiz; and *Thrissonotus*, Agassiz.

The genus *Thrissonotus* was instituted by Agassiz † for the accommodation of a fossil fish intermediate between *Sauropsis*

\* Palæontographical Society, vol. xxxi. (1877).

† Rech. sur les Poissons fossiles, vol. ii. pt. 2, p. 128.

and *Thrissops*, having the dorsal fin situated in the middle of the back and the anal fin extended backwards, as in the latter genus. The specimen was in the collection of Lord Enniskillen, and is now at the museum in Cromwell Road. It is from the Lias at Lyme Regis, and was named *T. Colei*. The specimen has since been figured and fully described by Sir P. Egerton in the 'Decades' of the Geological Survey (decade ix. pl. ii.). The dorsal fin corresponds in position to those of *Oxygnathus*. The scales are comparatively small, more or less rhomboidal in form, ornamented by raised ridges, and with a smooth posterior outline, in this respect differing from the specimen now under description. The anal fin is remarkably extended, measuring 1.75 inch along the base and containing fifty or sixty rays.

The genus *Cosmolepis* was established by Agassiz in MS. for a single specimen in Lord Enniskillen's collection from the Lias of Barrow-on-Soar. The scales resemble those of *Thrissonotus*, except that they are smaller in proportion to the size of the fish, there being about sixty in a dorso-ventral row, and their surface is more thickly ornamented by raised lines of the enamel. The anal fin is extended, though not so far as in *Thrissonotus*. The fin-rays are divided transversely into numerous ossicles. The genus is fully described by Egerton in decade ix. pl. i. of the Geological Survey.

The third genus of the Palæoniscidæ of Traquair occurring in the Liassic formation is *Oxygnathus*, described and illustrated by Sir P. Egerton in the eighth decade of the Geological Survey, pl. ix. It is a long and gracefully slender fish, with numerous small scales ornamented with oblique ridges similar to those of the two genera previously mentioned. The jaws are furnished with numerous small incurved teeth intermixed with larger ones. The most characteristic feature rests in the form of the tail, which is deeply cleft into two lobes, the upper one measuring 3.5 inches in length, the lower one only 2.5, the fish measuring 11 inches from the snout to the fork of the tail. The upper lobe "has a scaly investment from the base to the extremity, below which issues a fringe of innumerable fine rays, with frequent transverse articulations and longitudinal bifurcations: the lower lobe contains about twenty-four rays; of these the strongest occupy the middle of the lobe, those of the upper and lower margins becoming gradually finer as they recede from the centre" (see supplement to decade viii.). The teeth of the genus *Centrolepis*, Egerton (decade ix. pl. v.) are similar to those of *Oxygnathus*. The scales are very thick, their exposed surface covered with coarse rugæ, arranged, not as in the other genera mentioned, in a longitudinal direction, but transversely.

The specimen now described, whilst it agrees in family characteristics with the genera mentioned above, differs considerably in those less important peculiarities which constitute their generic features. In each instance the size and ornamentation of the scales is distinct from this one, and the specimen now described is also more especially divergent from *Thrissonotus* and *Cosmolepis* in the non-extension of the anal fins. There are no intermediate small teeth, as in *Centrolepis* and others; and the deeply forked caudal fin, with its long upper lobe invested to its extremity with scales, is a character which readily distinguishes *Oxygnathus*, and separates this specimen from that genus. Hence there appears to be no alternative but to form a new genus under the title *Lissolepis*, with the specific designation *serratus*.

*Locality.* Lias, Lyme Regis.

#### EXPLANATION OF PLATE XVI.

*Fig. 1.* *Lissolepis serratus*, Davis. Natural size.

*Fig. 1 a.* Scales, enlarged.

L.—On the Neuroptera collected during the recent Expedition of H.M.S. 'Challenger.' By W. F. KIRBY, Assistant in Zoological Department, British Museum.

THE Neuroptera collected during the voyage of the 'Challenger' were not very numerous, but included several interesting species. With the exception, however, of a small series from the Philippines, which were sent home in papers, the greater number were destroyed by having been placed in spirit—a means of preserving insects which is just as ill adapted for large-winged insects, like dragonflies, as it is for soft-bodied or hairy insects, which should always be preserved dry.

I have only ventured to describe one new species from Tongatabu.

### NEUROPTERA.

#### ISOPTERA.

##### Termitidæ.

##### 1. *Termes fatalis* (?).

*Termes fatale*, Kön. Schrift. Berl. nat. Freunde, iv. p. 1, pl. i. figs. 1-9 (1771).

*Termes fatalis*, Hag. Linn. Ent. xii. p. 143 (1858).

Philippines.